University of Illinois at Urbana-Champaign
Champaign, IL

Project title: Demonstration of Portal Mechanisms for Enhanced Resource Integration in the Academic Information Environment

University of Illinois at Urbana-Champaign

Text Responses Document

Abstract

The University of Illinois at Urbana-Champaign (UIUC) Library is seeking funding for an 18 month Demonstration project entitled: Demonstration of Portal Mechanisms for Enhanced Resource Integration in the Academic Information Environment. This project will look at portal and retrieval mechanisms that can better integrate the library's multiple search and discovery tools with the expanding universe of distributed primary and secondary information content.

This project will develop and test a set of prototype multi-modal Library portals designed to provide enhanced resource integration in an academic library environment. The project will develop portal mechanisms that build on metasearch technologies and assisted search techniques developed and deployed over the last year at the UIUC Library. The interface, portal, and retrieval tools developed in this project will be tested within three diverse set of academic library users, including: (1) graduate students and faculty in engineering and physical sciences; (2) undergraduate students across all disciplines using a custom federated search system; and (3) the users of the Illinois Harvest project. The prototype portals will be evaluated using transaction log analysis and focus group and individual interviews and surveys. It is expected that the transaction logs and user surveys will show that portal user information needs are being met and that portal users are being directed to the appropriate information discovery tools and subsequent primary and secondary resource content. The information gathered in user studies and transaction logs informs portal design decisions and allows us to develop more empirically-based portal mechanisms that can better meet identified user information needs.

The project will focus on providing enhanced resource integration at three important nodes in the campus environment: (1) from within custom Library portals; (2) as a service from within the overarching campus portal; and (3) from within specific course management systems. A key focus of this project will be in developing search assistance tools that interpret, analyze, and normalize user-entered search arguments in order to route the search arguments to the most relevant information tools (OPAC, ERM, A&I Services, full-text providers, etc.) that meet the specific user search needs. The project will develop a classification typology of user search arguments with associated mechanisms for determining optimal resource identification and routing.

The development and testing of these portal integration technologies is critical to the success of the nascent next-generation resource discovery systems that are presently under development and also to the improved functioning of metasearch systems.

The work performed in this project will complement the Contextual Resource Evaluation Environment (CREE) project funded through the Joint Information Services Committee (JISC). The project will also explore the application of the NISO MXG (Metasearch XML Gateway) standard and the OpenSearch 1.1 standard (in conjunction with the OpenURL standard) in the development of the portal metasearch functionality.

University of Illinois at Urbana-Champaign

Narrative

1. Assessment of Need

The University of Illinois at Urbana-Champaign (UIUC) Library seeks funding for the development and testing of portal mechanisms that will provide academic end-users with enhanced resource integration within the distributed information landscape. This project will look at portal and retrieval mechanisms that can better integrate the library's multiple search and discovery tools in order to provide enhanced access to distributed primary and secondary information content. Utilizing transaction log analysis and focus group and individual interviews, the project will investigate the efficacy of resource integration techniques and the utility of identified search assistance techniques designed to route user search arguments to the most relevant discovery tools and repositories.

University researchers and students must navigate a myriad of surface and hidden Web content made available through multiple access mechanisms. These distributed primary and secondary information resources include:

- licensed publisher full-text repositories;
- locally digitized primary resources;
- full-text content from large-scale digitization projects, such as Google Book and Open Content Alliance initiatives;
- faculty and student generated scholarly, instructional, and grey content; and
- Open Archive Initiative Protocol for Metadata Harvesting (OAI-PMH) and other harvested or spidered objects.

Moreover, the integration of these information resources must be accomplished within a search and discovery environment comprised of overarching library, campus, and vertical portals that guide users through:

- local and national online public catalogs,
- Abstracting and Indexing (A & I) services with value-added full-text link resolver transports,
- electronic resource management (ERM) systems,
- digital asset management systems,
- institutional repositories,
- course management systems,
- broad-based and vertical Web search engines, and
- social networking mechanisms.

The challenge is in navigating users through an information environment with heterogeneous retrieval mechanisms and an expanding universe of distributed digital content and resources.

There is a critical need for better interoperability between the numerous discovery tools and distributed information content. Fang observed that libraries face the dilemma of dealing with highly heterogeneous and distributed systems at both the technical level and at the conceptual level (Fang, 2004). Lynch and others have pointed out that there is a

huge difference between providing access to discrete sets of digital collections and providing true integrated digital library services (Lynch, 2002). Mischo notes that the "goal of seamless federation across distributed, heterogeneous resources remains the holy grail of digital library work" (Mischo, 2005). Several recent comprehensive white papers on next-generation resource discovery systems have emphasized the vision of an emerging integrated information environment (Calhoun, 2006; University of California, 2005). Calhoun contends that it is the research library's role to "switch users in their communities from where they find things to library collections" (Calhoun, 2006, p. 37).

There is also a clear mandate for better integration of the library's search and discovery tools. Calhoun's report to the Library of Congress, which synthesizes the opinions of a number of experts in the field, provides a blueprint for an evolving suite of overarching information services (Calhoun, 2006). The report notes that users do not understand the difference in scope between the various access tools provided by libraries and states that the future will require "a chain of services enabling users to find, select, and obtain the information objects they want" (Calhoun, 2006, p. 38). Detlor and Lewis, citing users' general confusion about when to use the library catalog and when to use other e-resource databases, calls the forced separation of library access tools "the biggest technological barrier to facilitating an integrated information seeking environment." Improved access to serials has been an identified point of need. A report on access to e-journals prepared at the University of Wisconsin-Madison notes that users still need to be prepared to search both an SFX e-journal list and the OPAC to get the full picture of journal availability (Cohen, et al, 2006).

These integration concerns are particularly acute given the propensity of users to approach library access tools with a variety of information needs. The early online catalog federated studies showed that users approached the OPAC fully expecting to find access to journal articles (Lawrence, 1985). Later OPAC use studies have verified this behavior and have also shown that end-users approach the catalog with a continuum of topical and known-item searches looking for a variety of information resources (Larson, 1991; Cooper, 2001, p, 43). Yu and Young, in their 2004 OPAC log analysis at California State University, Los Angeles, found that a large number of OPAC searches would have been more successful in other Web-based resources and advocated the use of federated search technologies (Yu and Young, 2004).

And we now have a body of literature, based on user studies and transaction logs, which can inform portal design decisions and allow us to develop more empirically-based portal mechanisms that can better meet identified user information needs. These studies are described in more detail below.

Library portals are currently being designed and deployed to provide a single point of access to a wide variety of content and supporting services and tools (Jackson, 2005). The library portal is not a single technology, but rather a combination of multiple systems, standards, and protocols that interoperate to create a unified existence for the user (Maloney and Bracke, 2005). Dempsey views the goal of portal development as a "more effective integration of information resources into the research and learning workflows of

the user." Several articles on metasearch implementations have suggested that users could best utilize these services at a point of need, such as from within a course management system (Tallent, 2004; Christenson and Tennant, 2005)

This demonstration project will develop and test a set of prototype multi-modal Library portals designed to enhance resource integration. The project will explore a variety of portal mechanisms and techniques designed to integrate the multiple discovery tools and provide enhanced access to distributed information content. We will utilize portal transaction logs to develop search assistance tools that classify and normalize user-entered search arguments to determine optimal resource identification and routing to appropriate discovery and repository targets. In particular, these portal tools will provide improved and integrated access to licensed commercial full-text repositories, locally created digital content, full-text from large-scale digitization efforts, and harvested collection level and item level metadata. The project will also test methods for merging and presenting both metadata and other surrogates from retrieved information content. The project will explore the effectiveness of resource identification and discovery techniques vs. the integrated display of merged and ranked retrieved records.

This demonstration project will utilize portal mechanisms that build on metasearch technologies and assisted search techniques developed and deployed over the last year at the UIUC Library. The portals were implemented in a custom engineering and physics portal, an undergraduate federated search system, and Illinois Harvest--a site that provides access to digital scholarly resources about Illinois or by Illinois scholars. The current production version of the Grainger Engineering Library Information Center portal is available at http://search.grainger.uiuc.edu/top/. The UIUC undergraduate federated search site is available at http://search.grainger.uiuc.edu/searchaid/searchassist.asp and the Illinois Harvest site is at http://illinoisharvest.grainger.uiuc.edu/.

The custom engineering portal utilizes a hybrid tab-like and portlet interface to provide access functions based on identified user information needs. Behind each of the Grainger portlets is a suite of locally developed metasearch applications that operate over multiple retrieval tools. For example, the "Look for Specific Article" function utilizes the locally developed Journal and Article Locator (JAL) software that--depending on the user input string—performs a number of asynchronous metasearch operations (Mischo, et al, 2006). The JAL will: (1) search the CrossRef database to extract a Digital Object Identifier if available; (2) perform two searches in the UIUC ERM--a start of title and title keyword search; (3) perform two searches in the local OPAC--a start of serial title and keyword serial title; (4) search the UIUC SFX local link resolver knowledgebase for full-text links; and/or (5) perform an author, journal title, and year of publication search in several A & I Service databases. The results of these searches in the form of links to retrieved resources are displayed to the user using AJAX technology. Customized metasearch techniques are used throughout the portal. In the same fashion, the undergraduate portal routs users to the Library OPAC, various A&I services, and the UIUC ERM in response to the user-entered search argument.

The UIUC Library engineering portal and undergraduate federated search system are instrumented and all user-entered search arguments along with any system performed normalizations are captured. In addition, all clickthroughs to remote A&I Services and other information resources are recorded. As of February 2007, over 100,000 user search arguments have been captured.

A key focus of this project will be in utilizing portal transaction logs to develop search assistance tools that interpret, analyze, normalize, and classify user-entered search arguments. The project will develop a classification typology of user search arguments with associated mechanisms for determining optimal resource identification and routing to appropriate discovery and repository targets. Search arguments will be routed to the most relevant discovery tools (OPAC, ERM, A&I Services, full-text content providers, etc.) that meet the specific user search needs. The development of the search assistance algorithms, the access tool selection and routing functions, and the integration of retrieved resource content are the keys to the success of the project.

The work performed in this project will build on the previous UIUC Library portal and supporting metasearch work. The project will focus on providing enhanced resource integration at three important nodes in the campus environment: (1) from within custom Library portals; (2) as a service from within the overarching campus portal; and (3) from within specific course management systems. To facilitate searches and links out from the course management systems and the university portal, a set of custom REST (Representational State Transfer) services and APIs that publish search results in a standard format will be developed. The use of the OpenSearch 1.1 (http://www.opensearch.org/Specifications/OpenSearch/1.1) and NISO MXG (Metasearch XML Gateway) (http://www.niso.org/standards/resources/RP-2006-02.pdf) standards in the REST-based services will be explored.

The development and testing of these portal integration technologies is critical to the success of the nascent next-generation resource discovery systems that are presently under development and also to the improved functioning of federated search systems.

The interface, gateway, and retrieval tools developed in this project will be tested within three diverse set of academic library users, including: (1) graduate students and faculty in engineering and physical sciences; (2) undergraduate students across all disciplines using a custom federated search system; and (3) the users of the Illinois Harvest project.

The work performed in this project will complement the Contextual Resource Evaluation Environment (CREE) (2004-2005) project funded through the Joint Information Services Committee (JISC). CREE investigated user requirements for the presentation of a range of search tools in a variety of local institutional environments (http://www.hull.ac.uk/cree/). The CREE study utilized user surveys and portal testing through a series of mocked-up demonstrator pages through the JSR 168 portlet API. The initial CREE study concluded that there was a clear interest on the part of end-users to make use of search tools in different local institutional environments, including within course management systems. The CREE report concludes that it is the role of libraries to

facilitate and assist end-user access to the far-ranging information landscape. A follow-on award from JISC to the CREE project group will commence in February 2007. The new CREE work will focus on assessing the value and workflow involved in: presenting discovery to delivery services through a portal framework. The new project will also build and test a small number of portlets to demonstrate findings and will test user interaction with these portlets within a portal framework environment.

2. National Impact and Intended Results

This is a propitious time to examine these critical digital library issues. This project will provide UIUC researchers with the resources to investigate resource integration issues at a time when we are witnessing sea changes in how users access and utilize information resources. The published research studies on user information seeking behavior focuses on specific standalone Web search engines or single organization Web sites (Spink, at al, 2005; Jansen and Spink, 2005; Jansen and Spink, 2006; Koshman, Spink, and Jansen, 2006; Jansen, Spink, and Saracevic, 2000). These studies have not addressed resource integration within the typical academic information environment with its panoply of distributed heterogeneous resources.

The standalone Web search engine studies have found that the majority of users of Web search engines enter queries of two or three terms; use very simple query syntax; seldom use Boolean operators and, when they do use them, they often apply them incorrectly; and typically only view the first page of results (Topi and Lucas, 2005a and 2005b; Koshman, Spink, and Jansen, 2006; Weiderman and Strumpfer, 2004). The few studies on academic sites, including the preliminary analyses of our transaction logs, show a higher number of terms per query and queries per session (Yi, et al., 2006; Jansen, Spink and Saracevic, 2000).

This proposed project will build on the UIUC portal design work in an effort to provide more effective resource integration for the sample groups. In particular, the project will examine the information utility of licensed digital content vis-a-vis locally created primary content and full-text content from large-scale digitization efforts. This is particularly important because of the increasing investment academic libraries are making in licensed digital resources. The average ARL library spent 37% of their budget on licensed electronic resources in 2004-2005, totaling over $367 million in e-resource expenditures (ARL statistics, 2005). This percentage is increasing. A number of ARL libraries are now spending more than 50% of their collections budget on electronic resources. One of the key questions facing academic libraries is how useful their locally digitized content is compared to commercial licensed digital content.

The primary mechanism for integrating A&I Services, OPACs, and digital content has been the metasearch engine. Numerous libraries have purchased commercial metasearch systems from vendors such as Ex Libris (MetaLib), Endeavor (ENCompass – now no longer being marketed), WebFeat, Serials Solutions, and others.

As Calhoun has noted, these systems, for the most part, are "not meeting early expectations for tying together the fragmented landscape of scholarly information resources" (Calhoun, 2006, p. 9). The commercial metasearch products lack flexibility and limit the customization and integration options available (Reese, 2006). The California Digital Library report on integrating information resources prepared under an NSDL grant (Christenson and Tennant, 2005) notes that the commercial metasearch systems lack the ability to adequately tailor the system for a purpose or audience and states that for "libraries with the available staff time and expertise, one of the best deployment options may be to create metasearch services that are tailored for a particular audience or need.". This is particularly true for custom metasearch applications such as the Journal and Article Locator described above that requires the selective chaining together of local OPACs, ERMs, digital asset management systems, link resolver knowledgebases, and A & I services in a fashion that depends on particular user information needs. For these reasons, institutions such as Oregon State, California Digital Library, Simon Fraser University, Georgia Tech, Illinois, and others are creating custom metasearch applications or heavily utilizing vendor system APIs.

There is a general consensus that metasearch may not be the perfect solution but that it is addressing the right problem. The absence of widely applicable and flexible metasearch tools in the national digital library community is a significant barrier to the realization of the goal of fully integrated research library access services. While much work has been done on the development of digital content, there is a clear need for integration technologies to realize the goal of true service-centered digital libraries. The need to create such tools is a necessary next step in the integration of digital resources into the scholarly environment. This project will explore the features set of such tools and will go some way to inform the development of the next-generation of metasearch tools.

Several studies have explored the value and usefulness of assisted search techniques (Jansen 2004; Jansen and McNeese, 2005; Kruschwitz and Al-Bakour, 2005). Jansen defines automated search assistance as a goal-driven set of dialogues, actions, or responses by an information retrieval system with the aim of improving the information searching experience for the user (Jansen, 2004, p. 911). Griffiths and Brophy note "there has been a shift toward the introduction of search features that respond to and adapt to the ways in which users actually search these systems" including assisted query formulation and adaptive navigation techniques (Griffiths and Brophy 2005). Moukdad and Large examined the transaction logs of a Web search engine and concluded that the majority of problems were with the initial search query and that the "solution must be found at this first step in the search process and not further down the line" (Moukdad and Large, 2001).

Weiderman and Strumpfer note that is has "become clear from the literature that many users found the formulation of a search query difficult." (Weiderman and Strumpfer, 2004) Lorcan Dempsey advises that libraries need to "provide service which fits into patterns of user behavior and abstracts away from the boundaries of database providers" (Dempsey, 2005). Assisting users in search strategy formulation and navigation and directing queries to the appropriate access tools is critical in an environment where we

know users approach the portal with a continuum of information needs. This will be one focus of this project.

In particular, the project will develop a classification typology of user search needs based on an analysis of user search arguments from portal transaction logs. These search arguments will then be used to determine optimal resource identification and routing to the most relevant discovery tools (OPAC, ERM, A&I Services, full-text repository, full-text content providers, etc.). It is expected that the transaction logs and user surveys will show that portal user information needs are being met and that portal users are being directed to the appropriate information discovery tools and subsequent primary and secondary resource content. The information gathered in user studies and transaction logs informs portal design decisions and will allow us to develop more empirically-based portal mechanisms that can better meet identified user information needs.

The development of the search assistance algorithms, the access tool selection and routing functions, and the integration of retrieved resource content are the keys to the success of the project.

There is presently a great flurry of activity on next-generation resource discovery systems. These include offerings from commercial vendors and database software companies such as Ex Libris' Primo, OCLC's Worldcat.org, Endeca, FAST, Siderean, Aquabrowser, and Vivisimo. Several of these systems have introduced results clustering, faceted displays, and social collaboration technologies into OPACs. Several of these systems only focus on enhanced discovery over traditional print collections. However, these systems are beginning to offer enhanced resource integration and comprehensive access to print, born digital, and scanned digital collections. It is expected that this project will inform the development of these next-generation resource discovery systems as well as the continuing development of metasearch technologies.

3. Project Design and Evaluation Plan

This proposed project will build on previous UIUC Library work on portal design, custom metasearch applications, and adaptive search assistance. The project will use assessment and evaluation measures, including transaction log analyses, focus group and individual interviews and surveys, over users of the prototype portal. Evaluations will take place in a research and instructional environment comprised of users of the Grainger Engineering Library portal, the undergraduate federated search system, and the Illinois Harvest users. These portals are available to all UIUC faculty, students, and staff and all transaction log data will be captured.

This project will develop and test portal designs and access mechanisms that provide enhanced resource integration. A number of research questions and issues will be explored in the course of carrying out the project's designated tasks. These tasks include:

1. Analyze collected transaction log data that includes comprehensive user-entered search arguments and user clickthroughs to distributed resources. The project will

start by analyzing the 100,000 user search arguments collected over the last year within the Grainger Library portal and through the undergraduate library federated search system.

2. Look at issues connected with effective access tools integration and subsequent retrieval: How best can these resources be integrated? Can algorithms be written to selectively identify the most relevant discovery tools for a type of search (that is, can we identify a "journal title" or "specific journal article" search and then be certain we've routed the search to the best access tools (CrossRef, ERM, OPAC for print version, A& I Service, Google Scholar, etc)? Where do the full-text monographic projects (OCA, Google Books) fit in retrieval schema?
3. Develop a classification typology for user entered search arguments in order to provide assisted search and navigation, perform search normalization, and better characterize the broad continuum of user search requests and user search needs. This search typology will be used to map search categories and characteristics into recommended relevant search and discovery tools (OPAC, A&I Services, ERM, publisher sites, digital asset management systems, institutional repositories, etc) and to develop algorithms for effective custom resource chaining and integration.
4. Using the user search typology, develop and test prototype library portals focusing on engineering and scientific, undergraduate, and cultural heritage user needs.
5. Conduct further transaction log analysis and focused group and individual interviews and surveys to better determine user needs and the effectiveness of various portal approaches.
6. Develop a REST-based search methodology for providing effective resource retrieval and retrieval tools integration from within the UIUC course management systems (primarily WebCT and Moodle) and university portal (uPortal based).
7. Explore the application of the NISO MXG standard and the OpenSearch 1.1 standard (in conjunction with the OpenURL standard) in the development of the portal metasearch functionality.
8. Develop enhanced merging, ranking, and deduplication mechanisms for better integrating results sets of locally created content, full-text content from large-scale digitization efforts, licensed commercial content, and harvested collection and item level data.
9. Explore the effectiveness of resource identification and discovery techniques vs. the integrated display of merged and ranked retrieved records.

As a result of these activities, the project will:

1. Develop portal technologies that integrate search and discovery tools that provide access to licensed electronic resources, locally digitized content, full-text content from mass-digitization projects, and OAI-based services;
2. Achieve integration of distributed information resources within course management systems and virtual learning environments;
3. Study the integration of the library's online catalog and e-resources tools into information portals and consolidated search environments

Other specific research questions that will be addressed in the course of this demonstration project include;

1. the usefulness of the NISO Metasearch Initiative XML Gateway standard and the OpenSearch 1.1 standard for the development of enhanced metasearch and federation middleware;
2. the efficacy of search assistance and adaptive navigation algorithms that mimic the behavior of a trained reference librarian in heuristically identifying and searching online information resources, including performing multiple searches within a single information resource to identify best search and quorum search algorithms;
3. the examination of fielded search vs. single entry search box options;
4. The potential for close interoperability between the library's myriad discovery tools and distributed information content.
5. A performance comparison of engineering and physical science A & I services (INSPEC, Compendex, Scopus, WOS, CSA) with vertical Web engines (Google Scholar, Windows Live Academic, Scirus).

This project will develop and test overarching user access mechanisms and access technologies designed to better integrate complementary access tools and information content resources within an academic library environment. There is a strong institutional commitment to portal design and development and the UIUC project work funded here will be ongoing and self-sustaining. Continuing funding will be provided by the UIUC Library.

The investigators will leverage a number of grant-funded services and collections projects, including numerous NSDL and IMLS NLG initiatives. The project work will dovetail with work performed under the UIUC-IMLS Digital Collections and Content (DCC) grant, the CREE Project funded by JISC, the OAI-ORE Pathways project, and the NISO Metasearch Initiative. While there is no formal relationship between IMLS and JISC (as there is between NSF and JISC), project staff will work in a consultative and collaborative fashion with CREE staff. There are several areas of overlap in the scope of the projects. The UIUC project will work at both a conceptual and operational level, conducting a thorough transaction log analysis on user search arguments, identifying a user search typology with associated resource tool targets, and constructing operational portals. These activities will all be of interest to the CREE project.

This project will utilize user needs data obtained under several IMLS projects, including the University of Pittsburgh user needs study, a University of Tennessee analysis of user needs and behaviors, and information-seeking behavior research at The Ohio State University.

The grant work will also focus on the development of best practices, middleware and Web services that provide resource integration within a library portal.

4. Project Resources: Budget, Personnel, and Management

The UIUC Library is providing the partial salaries of William Mischo, Mary Schlembach, Timothy Cole, and Michael Norman as cost share. Mischo is 10% on this grant request, 5% on an NDIIPP Technical Architecture grant being reviewed, and 5% on the UIUC-IMLS DCC grant that will be submitted in this IMLS cycle. Mischo is going off an IMLS 21st Century grant with Indiana University and UIUC in October. Cole is 5% on this grant request, 7% on the UIUC-IMLS DCC proposal, 3% on a Mellon Foundation grant through NCSA, and 3% on the Metadata for You and Me IMLS grant. Schlembach and Norman are 10% on this grant request only. Mischo and Cole are Research Professors and can spend up to 20% on grant activities.

Mischo has been PI on grants from NSF DLI-I, NSF NSDL, IMLS 21st Century, and the CNRI D-Lib Test Suite. He has been co-PI on an LOC NDIIPP grant, an IMLS DCC grant, and a Mellon Foundation OAI-PMH grant. Cole has been a PI on the UIUC-IMLS DCC grant, a Mellon Foundation OAI-PMH grant and co- PI on an NSF NSDL grant. Schlembach has been PI on an FRA grant and an Association of American Railroads grant, and co-PI on an IMLS 21st Century Librarian grant.

All equipment, supplies, and computing resources will be supported by UIUC institutional funds. The UIUC cost share for this grant will be close to 92%, including the partial salaries of the PIs, the Portal Designer, and the salary of a graduate assistant. We are also contributing travel funds to the UIUC cost share.

It is expected that the PIs on this grant will be involved in collaborative activities with Chris Awre and other individuals involved in the CREE project.

5. Dissemination

The results gathered in this project will be shared at conferences and published in the open literature. A Web site devoted to the project will be established. All the PIs have strong publication and presentation records.

It is anticipated that the technologies produced in this project, including the search assistance typology, the portal resource integration mechanisms, and the transaction log analysis technologies, will be shared with the community. All software developed in this project will be placed on SourceForge and made available to interested institutions.

6. Sustainability

The UIUC Library has a long history of innovation in digital library activities. The Library is committed to the continuing development of pioneering portal technologies in an operational environment. The Library has assembled the needed in-house expertise and committed the necessary computing capacity to continue the testing and implementation of enhanced library portals beyond the timeframe of this grant. It is expected that the work we will perform and report out under this grant will benefit the library community in general.